correlating the operation state changes of two-way switch operations and protective relay operations, facilitating accurate time-point stamping of state change data and eliminating any order switching between relay and CB operation state changes; and

a correlation result transmission circuit to send a result of said correlation circuit to said protection and control terminals via said communication network, respectively;

said power system monitoring and control host comprising[;]:

a correlation result reception unit to receive said result of said [correlation circuit] correlation processing unit; and

a CB operation display unit to display said result of said correlation received by said correlation result reception unit.

REMARKS

Claims 1-20 were pending in the application. By this Amendment, Applicants have amended claims 1, 10, and 12. Accordingly, Applicants submit claims 1-20 for reconsideration.

Initially, the specification has been amended editorially.

The Office Action rejected the claims under 35 U.S.C. § 103(a) over Figs. 11-16 in the application. In the present invention, a correlation processing unit, comprising a CPU and a memory unit, is provided within the protection and control unit. It correlates the operation state changes of two-way switch operations and protective relay operations and also facilitates accurate time-point stamping of state change data as well as virtually eliminating possible order switching between relay and CB operation state changes. In other words, the present invention prevents data indicating relay state changes from being mistaken for operation state changes and vice versa.

The main function of the known power system monitoring and control system of Fig. 11 is to detect and transmit state changes of the power system (11) to the display (45). When a fault, which is evidenced by state variables (currents, voltages) of the power system (11), has been detected by protective relay circuits (21), the relay circuits transmit the information of fault to the circuit breaker ("CB") control circuit (22). Then circuit 22 outputs a tripping/closure instruction to a switch CB 11a. Next the CB will trip or close corresponding to the information sent from control circuit 22. Subsequently, the CB state receiving circuit (24) receives a message about the open/closed state of CB 11a. The state information is then sent via transmission circuit 25 and transmission system 13, to the power system monitoring and control host (14). The operating states of the relay elements (21) of protective relay circuit 21 are also sent to host 14.

In Fig. 11, the state detection unit 41 of the power system monitoring and control host (14) picks up the CB and relay elements state change information and sends it to the CB relay correlation unit (43) which is located in the host 14. Unit 43 compiles the data and then appends the time point of detection and also the state change data file from storage unit 42. Then the CB relay correlation circuit (43) compiles a message associating the CB operation state changes and relay operation state changes. This is done by correlating the CB operating state changes and relay operation state changes, using the state change data that was transmitted to the power system monitoring and control host (14) from the protection and control terminal (12-1). The message file storage unit 44 stores the state change message compiled by the correlation unit 43. The message file is then sent to the display unit (45) which displays the state change message on the display screen.

Thus, as shown in Figure 11 when the relay circuits (21) senses a fault in the system, a message is sent to the control circuit 22. Control circuit sends a tripping or closure command to the CB to remedy the fault. The receiving circuit 24 gets the state change command of open/close and transmits this message via 13 from terminals 2-1 to the state detection unit 41 in the host 14.. The state detection unit 41 sends information to the data file storage unit (42) That information is then sent to the CB relay correlation unit 43. Correlation unit 43 compiles the data and records the time point of detection and subsequently compiles a message with the CB state change information and the relay state

change information. Then this message is sent to a file storage unit (44) and the file is sent to the display (45).

Because the correlation processing is performed by the system monitoring and control host (14) in Fig. 11, a discrepancy occurs between the time-point of the relay operation state change detection and the time-point of CB operation state change detection. Also, sometimes the order of the time-point detection's is reversed.

Additionally, the host (14) has to extract the state change information from the file storage unit (44) and correlate it every time there is a CB state change. Thus, the amount of data that is handled by the CB relay correlation unit 43 is extremely large and the time for processing is also quite long. The extraction, as mentioned previously, occurs in a certain time T1 before and after the time of detection of state change data of the CB. If T1 is too small, there is a risk of correlation overflow or there could be less displayed relays than actually operated in response to the CB operation state change. If T1 is too large there is a risk that each item of CB state change data would be correlated with even more state change data. This increases the correlation processing time. Further, every time a CB or relay is added to the power system new data needs to be entered into the correlation database and this takes a lot of time.

The present invention as shown for example in Figure 2 solves the above problems by providing the correlation processing in circuit 30 in the terminals 2-n. The correlation circuit 30 has a CPU (30a) and a memory circuit (30b). The correlation output of circuit (30) is fed to a correlation result transmission circuit (31), which is then sent through the LAN or WAN to the power system monitoring and control host (4), which then displays the information.

The correlation circuit (30) performs correlation of CB's 11a, 11b and relay elements 21a1 ~ 21a3. The correlation of relay operations and CB state change is effected at the protection and control terminals (2-1 ~ 2-n), as compared to that shown in Fig. 11 where the correlation is performed in the host (14). Because the correlation processing of the relay operation and the CB state change produced by the relay operation is performed in the protection and control terminals, the correct order of the separate time-points are obtained because the correlation is performed at least once before going through the

transmission system. Further, since the protection and control terminals 2-n, instead of the host (4) are used to detect the CB state changes and the relay operation state changes, there is no need to consider the discrepancy time T1 between relay operation detection time-point and CB state change detection time-point. Thus, only overflow or increase of correlation processing time caused by the setting of a discrepancy time T1 are avoided.

Therefore, a CB relay correlation database is not needed to control possible time-point order reversal or discrepancy time T1. Thus, a time consuming correlation database is not required.

Also, since the time-point of detection can be appended to the state change message right in the protection and control terminals, this allows for a very precise CB state change detection time point which can be displayed.

Additionally, the monitoring and control host (4) and the change message file can store a state change data file representing the state change data of each CB or relay element itself, the task of monitoring can be performed by utilizing the state change data file itself, thus improving the efficiency of the system.

In view of the above differences, applicants submit that the claims should be patentable.

Applicants respectfully submit that the application is in condition for allowance and request reconsideration. Should the Examiner have any questions or suggestions regarding this application, the Examiner is invited to contact the undersigned attorney at the telephone number shown below.

Respectfully submitted,

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